MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

(Site Investigations)

CYANAMID CANADA - NIAGARA

(Site No.9)

MONENCO ONTARIO LIMITED

JANUARY 1981

RW02
1 Waste Site Identification
2 Cyanamid Canada - Niagara
(SA)

PART 9 - CYANAMID CANADA (NIAGARA)

(Site No.9)

9.1 GENERAL INFORMATION

LOCATION:	Lot 4 City of Niagara Falls
PREVIOUS OWNER AND OPERATOR:	Cyanamid Canada Inc. Fourth Avenue Niagara Falls
PRESENT OWNER:	Mr. Cameron Calder 525 Wyckoff Avenue Wyckoff, New Jersey 07481 Tel: (201) 831-3378
DATE OF INVESTIGATION:	October 30, 1980
CONTACTS:	Mr. Cameron Calder (See above)
	Mr. Albert Smith Area One Supt. of Water Regional Municipality of Niagara 3599 Macklem St. Niagara Falls L2G 6C7 Tel: 295-4831

9.2 GENERAL METHODOLOGY

The general procedure for site investigations included interviews with site owners and/or operators concerning details of site histories and operations, collection of water samples, and determinations of combustible gas concentrations. Background information was obtained from topographic maps and aerial photographs, from "The Physiography of Southern Ontario" (Chapman and Putnam 1973), and from water well records on file with the Ontario Ministry of the Environment. From general site inspections, field maps were prepared to show the location of waste materials and sampling and testing points, and to show other pertinent features such as direction of drainage and vegetation.

Surface waters and wells within 100 metres, and in some cases within a few hundred metres, were sampled to determine the impact of leachate or runoff which had been in contact with waste materials. Where possible, surface water samples were collected from sources upstream of disposal areas to provide background information. Where warranted, shallow auger holes were constructed with portable equipment to obtain samples of groundwater beneath or adjacent to sites. Auger holes were also used to determine the thickness and character of waste and cover materials and to determine the depth to groundwater.

Water samples were membrane filtered, and then analyzed with a Hach Chemical Co. Model DR-EL/1 environmental laboratory. Analyses were usually performed within a day of sample collection. Following completion of the initial field program, selected sites were revisited and water samples were collected for more detailed laboratory analyses as indicated by the preliminary chemical analyses or by the characteristics of individual waste sites.

Concentrations of combustible gas were measured with a Bacharach Instrument Co. J-W Model H Gas-pointer, which is calibrated on methane and which reads directly the percentage of methane present. For most measurements, a 2.5 cm diameter steel rod was driven into soil or waste material, and withdrawn. The gas-pointer probe was fitted to a collar, which was then inserted into the top of the hole to form a seal. Many auger holes were also tested for the presence of combustible gas, as were buildings on or immediately adjacent to waste disposal sites.

9.3 SITE DESCRIPTION

The site, known as the St. Davids Landfill, is located on a west-facing slope of the Niagara Escarpment (see Location Map). A record of a water well (see Water Well Records, No.2346) at about the same elevation as the site reported that 20 metres of interbedded clay, sand, and gravel overlie limestone bedrock.

The landfill was operated for at least 20 years prior to its closure in 1975. The solid wastes dumped here orginated from Cyanamid Canada's Niagara Falls Plant, and included calcium carbonate, calcium oxide, ash, refractory bricks, and small amounts of coal and coke. The waste is a white to dark grey silty material with little cohesion.

The area covered by the waste forms a uniform slope of about 25 degrees and is approximately 300 metres across by 150 metres downslope (see Sketch Map). The silty waste material is generally 1.5 to 2.0 metres thick (see Auger Hole Records). It is overlain by 20 centimetres of silty clay fill and is generally underlain by rubble. An attempt has been made to stabilize the slope with rip-rap and grass. Erosion on the slope is minimal except near the base where there is some minor gullying and some limited cover exposures. Several mature trees have died at the base of the slope, but this is believed to be due to root burial since adjacent trees are healthy and it is evident on inspection that the ground level has been raised around the dead trees.

Shallow augering did not encounter a water table on the property. A deep auger hole (No.5) was drilled with a track-mounted CME55 hollow-stem auger to a depth of 21.3 metres at the base of the waste slope. The hole countered water at a depth of about 20 metres in silty fine sand. A strong ammonia-like odour was present in the silty sand to a depth of about 9 metres, while a less pungent but distinct odour persisted to a depth of about 18 metres.

The municipal groundwater supply for Niagara-On-The-Lake is located near the base of the escarpment directly below the landfill. Three recharge ponds are located in the well field. The two most southern ponds are supplied with water from the nearby hydro-electric power canals in order to provide the well field with a continuous supply of water. The well field was initially installed in 1961, and post-dates first use of the St. David's landfill site.

Mr. A. Smith reported that the northern pond (known as Pond No.3) is fed by small groundwater seeps located around the south-east corner of the pond. Concentrations of nitrate (as N) in these seeps has been measured and reportedly found to be generally between 20 and 30 milligrams/litre, in comparison with concentrations of less than 0.2 milligrams/litre measured in the two southern recharge ponds. Water from the municipal well (known as Well No.3) located approximately 40 metres south-east of the Pond No.3 reportedly contains greater concentrations of nitrate than the other municipal wells. In addition, Well No.3 has recently become encrusted with calcium carbonate deposits, whereas the other wells have not. Well No.3 is approximately 18 metres deep, and is finished in the overburden. Because of these observations, it has been suspected that the St. David's landfill site is affecting water quality of part of the well field. The Ministry of the Environment has recognized this for several years, and is monitoring quality of the water supply.

In 1970, the Ministry of the Environment studied an allegation that the St. David's landfill site could be releasing cyanide to groundwater beneath the site. The Ministry's report concluded that although a small amount of the waste contained low levels of cyanide (less than 4 parts per million), the municipal well field did not appear to be threatened with cyanide contamination. The well waters have been and continue to be monitored for cyanide, and the Ministry's drinking water quality criterion of 0.2 milligrams cyanide/litre has never been exceeded, or even closely approached.

9.4 DISCUSSION

941 WATER QUALITY

The three ponds located above the municipal well field and a creek located approximately 60 metres east of the pond were sampled for field analysis. The results (see Form 1) indicated no irregularities.

Samples for more detailed analyses were also collected from the ponds, as well as from a small groundwater seep located a few metres east of the northern pond (Pond No.3) and from Municipal Well No.1 cyanide was not detected (i.e. less than 0.5 milligrams/litre) in any of the samples. Nitrate (as N) in samples from the seep (No. GW2) and from Pond No.3 exceeded the Ministry of the Environment's drinking water quality objective of 10 milligrams nitrate (as N)/litre.

A sampling piezometer was installed in the deep auger hole located at the base of the landfill site. Because insufficient water collected in the piezometer at the time of installation, it has not yet been sampled.

942 COMBUSTIBLE GAS

Combustible gas was not detected at any of 22 test locations (see Combustible Gas Log).

9.5 CONCLUSIONS

The rip-rap and grass on the landfill slope have provided good slope stability, although there is some erosion near the base of the slope. The death of mature trees at the base of the landfill slope is considered due to root burial by fill (and possibly waste) rather

than to toxic effects of wastes or leachates.

The results of this and previous studies suggest that leachate generated by the waste is affecting water quality in the north-east area of the Niagara-on-the-Lake municipal well field. Silty fine sand at the base of the landfill slope has an ammonia-like odour to a depth of about 18 metres. This indicates that active transport of nitrogen compounds (which have been leached from the waste) is occurring and will continue for many years. Under more oxidising conditions, ammonia would be expected to convert to nitrate, and this may explain the relatively high level of nitrate measured in a small groundwater seep located a few metres east of the northern pond in the well field area. The overburden well (No. 3) closest to this seep reportedly contains higher levels of nitrate than the other wells.

It is also possible that calcium carbonate encrustation problems experienced by Well No. 3 may be related to leachate generated by the wastes, which reportedly contained a large amount of calcium carbonate.

9.6 RECOMMENDATIONS

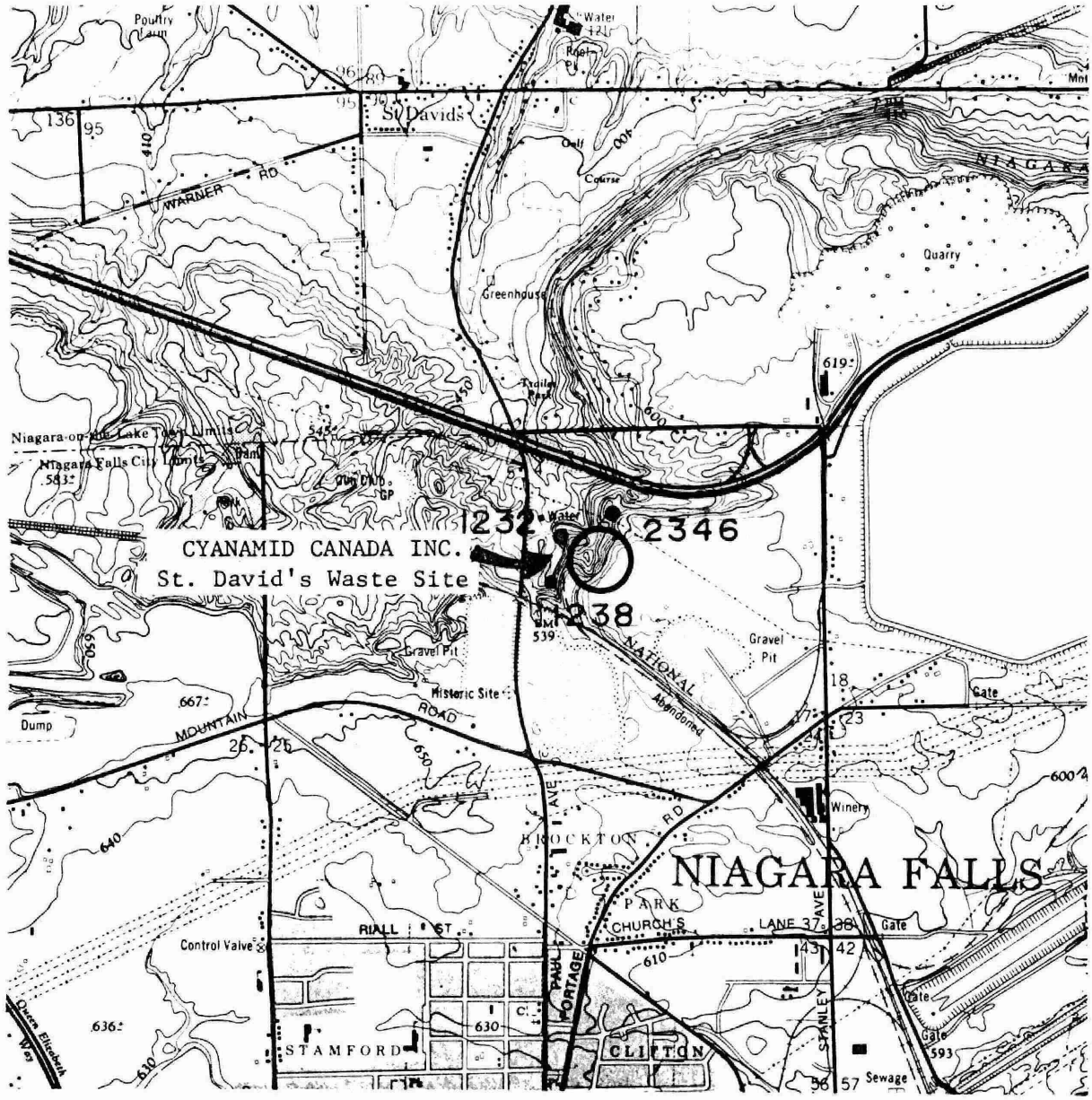
Monitoring of the landfill slope stability should continue, and water in the piezometer located at the base of the landfill slope should be sampled and analyzed. Groundwater seeps located at the south-east edge of the northern recharge pond should be re-sampled and analyzed for cyanide. The analytical technique should be capable of detecting cyanide at concentrations less than the Ministry of the Environment's drinking water quality criterion of 0.2 milligrams/litre.

Monitoring of groundwater quality in the municipal well field should continue as long as the field provides a water supply or is retained as a stand-by source. Also, if the well field is to continue to be pumped or retained on stand-by, the following studies should be implemented:

1. Evaluation of possible long-term effects on well water quality from leachate production and migration.

2. Methods of minimizing or controlling leachate production and migration.

3. Determination of availability of alternate water supplies or water treatment processes if well water quality should deteriorate beyond acceptable levels.



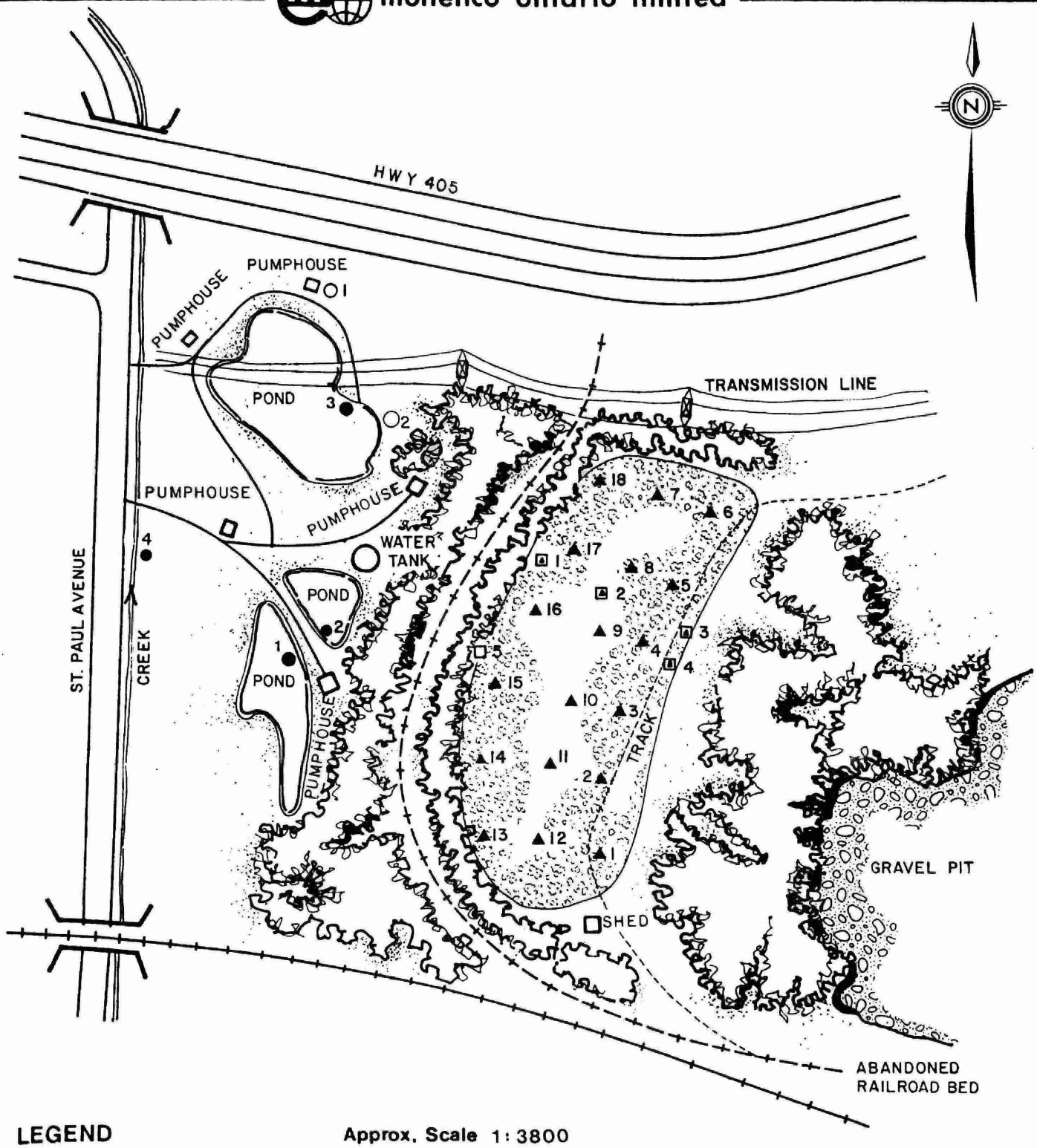
Scale 1 : 25,000

Metres 1000 500 0 1 km

LEGEND

- Water Well

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY PART I – SITE INVESTIGATION	
West Central Region	
CYANAMID CANADA INC. NIAGARA FALLS (Location Map)	
N.T.S. 30M/3h	DATE : 30 Oct. 14 Nov. 80



LEGEND

Approx. Scale 1:3800

- Existing Structures
- Trees, Bush
- Water Course
- Surface Drainage
- ▲ Gas Test
- ● Surface Water Sample
- ○ Ground Water Sample
- Limit of Waste
- □ Auger Hole

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

PART I – SITE INVESTIGATION

West Central Region

CYANAMID CANADA INC.
NIAGARA FALLS
(Sketch Map)

N.T.S. 30 M/3 h	DATE: 30 Oct. 80

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY - PART 1

WEST-CENTRAL REGION

WATER WELL RECORDS

SITE: CYANAMID CANADA-NIAGARA (Site No. 9)

REGIONAL MUNICIPALITY/COUNTY: Niagara

MUNICIPALITY: City of Niagara Falls

WELL NO.	UTM (EAST) (NORTH)	ELEV (ft)	CSG DIA (in)	WATER FOUND (ft)	STATIC LEVEL (ft)	WATER USE	DRILLER'S LOG (Depths in feet to which formations extend)
1232	654609 4778324	500	2	9	10	-	Red clay; medium sand (9); Fine sand (36); Fine and medium sand, gravel (72); Red shale (79)
1238	654515 4778180	500	2	33	16	-	Clay, medium sand (4); Gravel medium sand (10); Clay, medium sand, stones (33); Gravel, medium sand (38); Gravel (51)
2346	654560 4778430	468	2	12	6	-	Clay fill, boulders (4); Topsoil (5); Clay, medium sand, gravel (12); Fine sand, gravel, clay (32); Medium sand, gravel, boulders (40); Medium sand, gravel, clay (55); Fine and medium sand, clay (64); Limestone (65)

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY - PART I

WEST-CENTRAL REGION

AUGER HOLE RECORDS

SITE: CYANAMID CANADA - NIAGARA (site No. 9)

AUGER HOLE NO.	DEPTH (m)	WATER FOUND (m)	STATIC LEVEL (m)	LOG OF AUGER HOLE (Depths in metres to which deposits extend)
1	1.3	--	--	Silty clay fill (0.2); Clay (1.3
2	1.8	--	--	Silty clay fill (0.2); Grey silt waste (1.7); Sand, rubble (1.8)
3	0.6	--	--	Silty clay fill (0.2); Grey silt waste (0.5); Rubble (0.6)
4	1.1	--	--	Silty clay fill (0.2); Grey silt waste (1.0); Rubble, wood fragme (1.1)
5	21.3	19.8	--	Silty sand (1.4); Grey silty waste (3.4); Silty sand (21.3)

Ministry of the Environment
Ontario

LABORATORY ANALYSIS (FIELD)

FORM 1
Industrial Site Identification Study

MOE Region West-Central Date 30/10/80 Company Name Monenco Ontario Ltd.

Site CYANAMID CANADA - NIAGARA (Site No. 9)
(Lot, concession #, or UTM coordinates, name, address)

1 Leachate — ON-SITE TESTS

A. Water bodies within 100 Metres — Surface Water Samples

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	23	22	35	75						
2) TDS										
3) Suspended Solids										
4) Alkalinity	115	105	165	210						
5) Conductivity	240	200	490	650						
6) pH	8.1	8.6	7.8	8.0						
7) Hardness	145	115	230	340						
8) Sulphates	16	28	90	115						
9) _____										
10) _____										

B. Wells within 100 Metres — Ground Water Samples

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	70									
2) TDS										
3) Suspended Solids										
4) Alkalinity	265									
5) Conductivity	880									
6) pH	7.0									
7) Hardness	600									
8) Sulphates	290									
9) _____										
10) _____										

(All values mg/L, except conductivity (μS/cm) and pH. Alkalinity and hardness expressed as $CaCO_3$).

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes, complete Form II, Lab Analysis. If no, go to Part 2, Gas.

2 Gas (See Combustible Gas Log)

C. On-site

Test Holes	CH_4		
#1			
#2			
#3			
#4			
#5			

D. Buildings

Name/Address	CH_4		
1.			
2.			
3.			
4.			
5.			

3 General Coments (vegetation, leachate springs, depth, odours, etc.) _____

(Detail all test point locations in a sketch on reverse side) (See Sketch Map)

Form completed by K.J. Goff

9-12
1666

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY - PART I

WEST-CENTRAL REGION

COMBUSTIBLE GAS LOG

SITE: CYANAMID CANADA-NIAGARA (Site No. 9)

DATE OF TEST: October 30, 1980

GAS TEST HOLE NO.	DEPTH (m)	GAS (%)
1	0.6	0
2	0.6	0
3	0.6	0
4	0.6	0
5	0.6	0
6	0.6	0
7	0.8	0
8	0.8	0
9	0.8	0
10	0.8	0
11	0.8	0
12	0.8	0
13	0.8	0
14	0.8	0
15	0.8	0
16	0.8	0
17	0.8	0
18	0.8	0
AUGER HOLE NO.		
1	1.3	0
2	1.8	0
3	0.6	0
4	1.1	0

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 2
Industrial Site Identification Study

MOE Region West-Central Date 14/11/80 Company Name Monenco Ontario Limited

Site CYANAMID CANADA - NIAGARA (Site No.9)
(Lot, concession#, or UTM coordinates, name, address)

A. Water bodies within 100 Metres
(2 litre samples)

Surface Water Samples

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Nitrate -N(mg/L)	0.14	0.04	16							
2) Barium (µg/L)	20	20	60							
3) Calcium (mg/L)	39	38	59							
4) Potassium (mg/L)	<1	<1	2							
5) Magnesium (mg/L)	8.6	8.4	22							
6) Manganese (µg/L)	<10	<10	<10							
7) Sodium (mg/L)	10	10	29							
8) Nickel (µg/L)	<10	10	<10							
9) Silicon (mg/L)	0.2	0.2	3.5							
10) Strontium (µg/L)	150	140	170							
11)										
12)										
13)										
14)										
15)										
16)										
17)										
18)										

B. Wells within 100 Metres
(2litre samples)

Groundwater Samples

Parameter	Result 1	2	3	4	5	6	7	8	9	10
1) Nitrate -N(mg/L)	0.98	23								
2) Barium (µg/L)	40	50								
3) Calcium (mg/L)	150	100								
4) Potassium (mg/L)	<1	<1								
5) Magnesium (mg/L)	51	30								
6) Manganese (µg/L)	280	40								
7) Sodium (mg/L)	40	89								
8) Nickel (µg/L)	20	<10								
9) Silicon (mg/L)	6.5	9.1								
10) Strontium (µg/L)	770	120								
11)										
12)										
13)										
14)										
15)										
16)										
17)										
18)										

Analyst A. Lipski

Name of Laboratory Barringer Magenta Ltd.

Any significant odour problems? Yes X No

Parameters analyzed, but sample values less than indicated detection limits:

Cyanide	<500 µg/L	Cadmium	< 70 µg/L	Molybdenum	<300 µg/L	Vanadium	< 5 µg/L
Silver	< 50 µg/L	Cobalt	< 50 µg/L	Phosphorus	<600 µg/L	Zinc	<20 µg/L
Aluminum	<300 µg/L	Chromium	< 8 µg/L	Lead	< 50 µg/L	Zirconium	<50 µg/L
Boron	< 5 µg/L	Copper	< 8 µg/L	Thorium	< 60 µg/L		
Beryllium	< 1 µg/L	Iron	<200 µg/L	Titanium	< 10 µg/L		

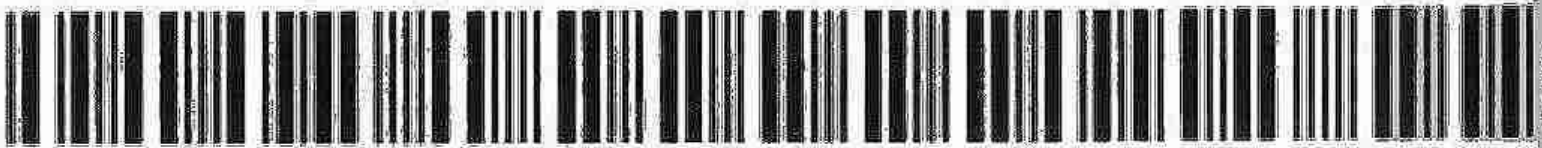
(Detail all test point locations in a sketch on reverse side) (See Sketch Map)

THE WASTE DISPOSAL SITE OVERLOOKS NIAGARA-ON-THE-LAKE.

THE WASTE HAS BEEN COVERED AND STABILIZED WITH RIP-RAP, AND WILD GRASSES NOW GROW ON THE COVER.

MUNICIPAL WATER SUPPLY FOR NIAGARA-ON-THE-LAKE IS LOCATED NEAR THE BASE OF THE WASTE DISPOSAL AREA. ONE OF THE PUMPING STATIONS AND RECHARGE PONDS IS SHOWN ABOVE.

A GROUNDWATER SEEP NEAR A RECHARGE POND WAS SAMPLED.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